

RECOMMENDATION FOR  
PROMOTION OR TRANSFER  
RESEARCH SCIENTIST SUB-GROUP

## EXHIBIT A

RECOMMANDATION EN VUE D'UNE  
PROMOTION OU D'UNE MUTATION  
SOUS-GROUPE: CHERCHEUR SCIENTIFIQUE


Employee's Surname and Given Names/ Nom et prénom de l'employé: <b>Kenaschuk, O. Edward</b>		PRI/CIDP: <b>11-318-112</b>																
Position Title/ Titre du poste: <b>Flax Breeder</b>		Position No./ No du poste: <b>362-0010C</b>																
Branch, Directorate, Division, Institute and Geographic Location/ Direction générale, direction, division, institut et lieu de travail: <b>Research Branch, Research Centre Morden, Manitoba</b>																		
Present Level/Niveau actuel: <b>RES 02</b>	Recommended Level/Niveau recommandé: <b>RES 03</b>	Date of Appointment to Present Level/ Date de la nomination au niveau actuel: <b>68/04/01</b>																
Present Salary/Traitement actuel: <b>\$68,888</b>	Salary Range/Échelle de traitement: <b>\$60,300-\$68,888</b>	Years since Ph.D/Années depuis le Ph.D.: <b>30</b>																
<p>Academic Qualifications/Études:</p> <table border="1"> <thead> <tr> <th>Degree/Diplôme:</th> <th>Year/Année:</th> <th>Discipline:</th> <th>University/Université:</th> </tr> </thead> <tbody> <tr> <td>Ph.D.</td> <td>1965</td> <td>Plant Genetics</td> <td>U. of Minnesota</td> </tr> <tr> <td>M.Sc.</td> <td>1957</td> <td>Crop Science (Plant)</td> <td>U. of Saskatchewan</td> </tr> <tr> <td>B.S.A.</td> <td>1955</td> <td>Crop Science (Plant)</td> <td>U. of Saskatchewan</td> </tr> </tbody> </table>			Degree/Diplôme:	Year/Année:	Discipline:	University/Université:	Ph.D.	1965	Plant Genetics	U. of Minnesota	M.Sc.	1957	Crop Science (Plant)	U. of Saskatchewan	B.S.A.	1955	Crop Science (Plant)	U. of Saskatchewan
Degree/Diplôme:	Year/Année:	Discipline:	University/Université:															
Ph.D.	1965	Plant Genetics	U. of Minnesota															
M.Sc.	1957	Crop Science (Plant)	U. of Saskatchewan															
B.S.A.	1955	Crop Science (Plant)	U. of Saskatchewan															
<p>Employment Record/Relevé d'emploi:</p> <p>October, 1965 → present: Research Scientist, Agriculture &amp; Agri-Food Canada, Morden Research Centre, Morden, Manitoba</p> <p>July, 1958 → Sept., 1965: Research Assistant, U. of Minnesota, St. Paul, Minnesota, U.S.A.</p> <p>Sept., 1957 → June, 1958: Research Associate, U. of Saskatchewan, Saskatoon, Saskatchewan</p> <p>May, 1955 → August, 1957: Research Assistant, U. of Saskatchewan, Saskatoon, Saskatchewan</p> <p>May, 1954 → Sept., 1954: Research Assistant, U. of Saskatchewan, Saskatoon, Saskatchewan</p>																		

COMMENTS AND RECOMMENDATION OF THE ACCOUNTABLE MANAGER  
(This section should provide an evaluation of the merits of the employee against the Classification and Promotion Criteria for the appropriate level as described in the Classification Standard.)

COMMENTAIRES ET RECOMMANDATION DU GESTIONNAIRE RESPONSABLE  
(Les observations doivent permettre de mesurer la valeur des réalisations du chercheur à la lumière des facteurs déterminants des niveaux de classification et de promotion de la Norme de classification.)

Dr. Kenaschuk has had a very productive career to this point, developing flax varieties which have set the standard for the world. Improvements in flax include increase in yield and oil content, introduction of pyramidal disease resistance to rust and wilt, resistance to chlorosis and modification of oil quality in reaction to client preferences. His varieties are grown on the majority of Canada's flax acreage and are the reason why flax is an important crop for the prairies. His varieties are also used extensively by other breeding programs nationally and internationally and form the genetic base of Linola (edible low linolenic acid flax) which is new to Canada. He also maintains direct contact, including germplasm exchange, with breeding programs in Argentina and the United Kingdom as well as with United Grain Growers, the only private flax breeding program in Canada. Dr. Kenaschuk has also been active on committees within the government, academia and industry. His interaction with industry has developed sufficiently that a majority of his work receives support to some degree through outside agencies. He has also provided valuable assistance in the management of the Research Centre as Section Head for the past 27 years and, on numerous occasions, as Acting Director. Dr. Kenaschuk exemplifies a senior research scientist and I highly recommend his promotion.

The above comments were prepared by R. Kucey.

  
Chairperson/Président

Nov 29/95  
Date

COMMENTS AND RECOMMENDATION OF THE PROMOTION REVIEW COMMITTEE:

COMMENTAIRES ET RECOMMANDATION DU COMITÉ D'EXAMEN DES PROMOTIONS:

Dr. Kenaschuk is a productive and creative mature senior research scientist. He is active in research to improve flax crop production in Canada. His strengths lie in his well established national and international reputation, strong leadership and scope of decision making. Dr. Kenaschuk meets the overall requirements for the SE RES 4 level and is recommended for promotion.

Denis Demers  
Accountable Manager/Gestionnaire responsable

96.03.01  
Date

COMMENTS AND RECOMMENDATION OF THE RESEARCH SCIENTIST DEPARTMENTAL REVIEW COMMITTEE:

COMMENTAIRES ET RECOMMANDATION DU COMITÉ D'EXAMEN MINISTÉRIEL DES CHERCHEURS SCIENTIFIQUES:

The Departmental Review Committee concurs with the Promotion Review Committee's comments and recommendation.

Promotion is approved.

Leon Martel  
Chairperson/Président

96-03-18  
Date

COMMENTS AND RECOMMENDATION OF THE INTERDEPARTMENTAL ADVISORY COMMITTEE:

COMMENTAIRES ET RECOMMANDATION DU COMITÉ CONSULTATIF INTERMINISTÉRIEL:

Departmental Representative/Représentant ministériel Date

## PRODUCTIVITY

1. **Dr. Kenaschuk has conducted an extensive breeding program in flax which has developed seven varieties: from 1975 to 1984, Dufferin, McGregor, NorLin and NorMan, which have been widely grown in the prairies (66% of the average 1.5 million flax acreage from 1978 to 1992) and which have contributed to a 25% increase in flax yields since 1978; and since 1991, AC Linora, AC McDuff, and AC Emerson, which are an improvement in yield, oil content and quality, lodging resistance and tolerance to chlorosis while maintaining good protection to the two major diseases of flax: rust and fusarium wilt. He collaborated with the U. of Saskatchewan in a breeding program (1978-1984) which developed two varieties, Flanders and Somme. Dr. Kenaschuk has developed flax lines with specific oil and seed characteristics, i.e. high oil content, high linolenic acid content, yellow seed color, to meet market requirements.**

Dr. Kenaschuk developed the flax varieties Dufferin (1975) (A-1), McGregor (1981) (A-2), NorLin (1982) (A-3), NorMan (1984) (A-4). The virulent races (370, 371) which appeared in the early 1970's attacked the major flax varieties grown at the time. Dr. Kenaschuk developed resistance to these new races in the variety Dufferin, which soon after its release, became the dominant variety in the prairies (40% of the flax acreage between 1978-1985) (Da-4, Da-5). He further improved resistance to rust by combining two resistance genes into the variety McGregor, while at the same time improving yield (5%) and lodging resistance. McGregor has been used extensively in breeding programs as a source of lodging resistance and high yield, i.e. development of the flax varieties Flanders and AC McDuff and the solin varieties, Linola 947 and 989 (Da-10). Dr. Kenaschuk was successful in combining high yield (equal to McGregor) and early maturity in the variety NorLin. Because of its wide adaptation, NorLin has been a major flax variety in the prairies (25-35% of the flax acreage since 1985) (Da-11). With the release of NorMan, he improved yield by 3% and increased oil by 1 percentage point while maintaining the early maturity of NorLin. NorMan has specific adaptation in Manitoba and has been grown on from 20 to 35% of the flax acreage in the province since 1986 (Da-12).

With the development of AC Linora (1991) (A-5), AC McDuff (1993) (A-6), and AC Emerson (1994) (A-8), Dr. Kenaschuk has made significant improvements in flax in: yield (6%) in both early and late seeding (AC Linora); oil content, 3-4 percentage points (AC McDuff); oil quality, 6 iodine units (AC Emerson); and lodging resistance, superior to that of McGregor (AC McDuff) (Da-27, Da-33, Da-40). He developed the first Canadian flax variety, AC Emerson, with tolerance to chlorosis, a condition in flax caused by nutritional imbalance, which can reduce yields to less than 25% of potential and delay maturity. AC Emerson will allow growers to produce a successful flax crop in areas of Manitoba, approximately 150,000 acres, where chlorosis is a common

problem. The chlorosis tolerance of AC Emerson is attributed to its superior seedling vigor (De-42, Df-38). Because of these improvements, the three varieties are expected to soon dominate flax production in Manitoba.

In the development of Flanders (1989) and Somme (1989), Dr. Kenaschuk performed crosses and provided early generation populations for selection at the U. of Saskatchewan, Saskatoon. He also made selections for oil content and quality and resistance to rust (B-3). Flanders has replaced McGregor because of its earlier maturity, higher yield potential and higher oil content (Da-18). Somme is an improvement over NorLin in yield and oil quality (Da-17).

Information on the merits of varieties was presented at meetings of flax growers and grower associations (C-2, C-3, C-6, C-7, C-8, C-15, C-16, C-18, C-21, C-27, C-32 & C-36). Information on flax varieties and crop management was also provided to growers, grower associations and industry through telephone calls, articles in newspapers and agriculture publications and interviews on radio and TV which are too numerous to document.

Dr. Kenaschuk has developed flax lines with specific oil and seed characteristics to meet market demands. He has developed a flax line, FP 1001 (1993) A-7), which has higher linolenic acid content (5-8 percentage points) than conventional varieties. Under a collaborative research agreement, exclusive rights to FP 1001 were given to NorCan Seeds Inc., Fisher Branch, MB, for contract production (B-14). NorCan Seeds supplies flax oil to a California based company for marketing as a source of alpha-linolenic acid in the health food trade. He has further increased linolenic acid content by 5 percentage points in lines which are being evaluated for agronomic potential (funded by M.I.I. and NorCan Seeds Inc.) (B-20). Dr. Kenaschuk has also improved oil content by 3-4 percentage points over the high oil variety AC McDuff (funded by Parsons Seeds Ltd., Beeton, Ont.) (B-13). He has incorporated the yellow seed color into the major flax varieties by the backcross method using six different sources of the yellow seed color (funded by Golden Seeds Farms, Fort Qu'Appelle, SK) (B-11). Yellow flaxseed is used in the baking industry and in the health food trade. There are no yellow seeded flax varieties registered in Canada at the present time. Dr. Kenaschuk has developed in cooperation with the Melfort Research Centre, early maturing flax lines with specific adaptation to northern production areas of flax (B-4). These lines are being evaluated in northern sites in cooperation with provincial agriculture agronomists and two private companies. He has broadened the genetic base for rust resistance by the development of lines with the new resistance genes  $L^{11}$  and  $M^6$  and by combining these genes with the commonly used  $L^6$  and  $K^1$  genes.

Dr. Kenaschuk has developed two flax varieties, Gold Merchant (FP 897) and Peak (FP 994) (1994, A-9) which have specific adaptation in the U.K. Exclusive rights to these

varieties were given to two Canadian/U.K. seed companies (B-6, B-17). The varieties are listed in the U.K. National List of Plant Varieties and were commercially grown in the U.K. in 1995. He also developed a dual purpose variety, Klasse (FP 944) (1995) (A-10), which is suitable for both fiber and seed production. The variety is being evaluated in NIAB trials in the U.K. by Parson Seeds Ltd., Beeton, Ont. (B-6, B-13).

2. **Dr. Kenaschuk developed, in collaboration with the Centre's agronomist, improved management practices to increase the efficiency of flax production and improve seed quality. He was fully involved in all aspects of research including technology transfer. Much of the new technology has been incorporated into crop recommendations for flax.**

Dr. Kenaschuk was instrumental in developing and establishing guidelines for seeding rates and dates so that growers can obtain optimum yields from newly released varieties. He demonstrated that delay in seeding into June can result in severe yield losses and reduced oil content and seed size, and identified varieties which performed best in late seeding. This information has been incorporated into variety recommendations (Da-16, Db-19, Db-20, Db-29, Db-34, Dd-1, Dd-4, De-36, Df-15, Df-20, C-22). Dr. Kenaschuk also provided information on boll loss and basal branching of flax varieties (De-42, Df-39). Studies in the allelopathic effects of canola stubble have resulted in crop recommendations to avoid rotation where flax follows canola or seeding flax directly into untilled stubble to reduce the problem (Da-14, Da-15, Df-11, Df-14, Df-17, Df-18, Df-19).

In a research study funded by the Flax Council of Canada (B-7), Dr. Kenaschuk developed technology for improved harvesting practices by: defining time of application and determined yield and quality reduction from early application of three chemical desiccants; defining optimum time for swathing flax and demonstrated that early swathing reduced yields but had minimal effect on seed quality; and determining the stage of maturity based on percent boll moisture that results in maximum yields after swathing or desiccation with three chemicals, and identifying four maturity indicators that are equally effective in determining optimum time for swathing flax (Da-8, Da-26, Da-29, Da-31, Db-29, Db-34, De-26, De-29, De-41, Df-5, Df-8, Df-9, Df-25, Df-28, Df-29, Df-30, C-28).

In a research study carried out in collaboration with Manitoba Agriculture and four flax growers, Dr. Kenaschuk demonstrated that flax varieties differ greatly in their tolerance to chlorosis and that the use of more tolerant variety such as AC Emerson is the most economical method of growing a profitable crop in areas where chlorosis is a problem (B-9). He also demonstrated that herbicides cause extensive damage when applied to chlorotic seedlings, and in some situations, the application of zinc can increase yield. These results have been incorporated into crop recommendations (De-42, Df-38).

In field and laboratory studies funded by the Flax Council of Canada (B-7), Dr. Kenaschuk determined the degree of frost required to injure immature seed, leaves, boll tissue and stems and the effect of frost on seed and oil quality. This information is of value to growers in predicting seed damage from a frost and in deciding swathing time before an anticipated frost to prevent loss of grade and to reduce loss of germinability. He also demonstrated that application of the desiccant, Reglone, to immature flax crop before an anticipated frost can reduce the proportion of dark seed and the loss of germinability (Da-24, Da-30, Da-32, Db-29, Db-34, De-42, Df-24, Df-32, Df-33, C-29). Dr. Kenaschuk determined that seed weathering of flax was due to continuous damp conditions over a prolonged period of time with higher temperature greatly accelerating the weathering process and that pathogenic organisms are involved in seed weathering. Weathered flaxseed are discolored and have lower germination and darker oil color. He demonstrated that flax varieties differ in their susceptibility to weathering (Da-25, Df-23, Df-34, Df-39, C-29).

3. **Dr. Kenaschuk collaborated with the plant pathologist in providing good protection to rust and fusarium wilt in flax by development of resistant varieties and improving the resistance to flax diseases.**

Dr. Kenaschuk identified new races (370, 371) of rust in flax that first appeared in 1973 and which attacked varieties that relied on the N<sup>1</sup> gene for resistance (De-19, De-21, De-23, De-25, Df-4, C-2, C-7). At the time, 93% of the flax acreage was sown to susceptible varieties. He was instrumental in identifying resistant varieties; Linott, the American variety Culbert (registered in 1978), and the new variety Dufferin (registered in 1975). These varieties were recommended for production in the prairies and thereby averting serious losses from rust (Da-6, Db-20, Dd-1, De-23, De-25, C-7, C-8).

Dr. Kenaschuk determined the genetics of rust resistance of eight commercial flax varieties. This information is essential in the development of multigenic rust resistant varieties. He incorporated five new effective genes (L<sup>11</sup>, M<sup>3</sup>, M<sup>6</sup>, P<sup>3</sup> and P<sup>4</sup>) for rust resistance singly into the Noralta and Redwood 65 background by the backcross method. These lines have been a valuable source of rust resistance in the breeding program to develop multigenic rust resistance. Dr. Kenaschuk identified new sources of resistance to rust, fusarium wilt and pasmo in accessions which has broadened the genetic bases of resistance in the breeding program (Da-9, Da-34, De-32, C-14).

Dr. Kenaschuk demonstrated the presence of another form of rust resistance in flax, designated as postseedling resistance (PSRR), which occurs in later stage in plant development and is different from specific or seedling resistance, commonly used as a source of resistance in flax varieties. He determined that commercial flax varieties differ significantly in PSRR and that PSRR is controlled by the same genes which determine specific resistance. Dr. Kenaschuk demonstrated that varieties with high

PSRR would be able to escape yield reduction by a new virulent race of rust and, therefore, PSRR can be combined with specific resistance to provide protection against a new race that can attack the specific resistance (Da-7, Da-20, De-27, De-28, De-33, De-35, C-10, C-11, C-17, C-20).

4. **Dr. Kenaschuk collaborated with the oil quality biologist in research studies to eliminate toxic compounds in flax to improve the safety of foods containing flaxseed or oil and to identify potential new uses of flax.**

Dr. Kenaschuk collaborated with the Winnipeg Research Station in a research study (funded by the Flax Council of Canada and M.I.I.) to develop PCR procedure for the detection of molecular markers which identify low levels of cyanogenic glucosides in flax (B-18). Hydrolysis of glucosides can produce hydrogen cyanide, a potent respiratory inhibitor, and thereby limiting the quality (8-10%) of flaxseed that can be used in food products or feed rations. The study has produced four RAPD molecular markers which identify low cyanogenic plants and has identified a gene in flax which is homologous (80%) with the glucosidase gene responsible for the production of cyanogenic glucosides in sweet clover. Dr. Kenaschuk's primary contribution to the study has been the identification of genotypes with low and high glucosides and the development of genetic populations required to verify markers (Da-21, De-43, De-47, C-30, C-34). The study, when completed, will result in an accurate, reliable and rapid method for detecting low cyanogenic glucosides for use in a breeding program. Once PCR technology is perfected for cyanogenic glucosides, it can also be used for other marker assisted selection programs, i.e. cadmium, Fusarium wilt.

Dr. Kenaschuk initiated a breeding program to reduce the level of cadmium in flax. Reduction of cadmium content in Canadian flaxseed would reduce potential health hazards and maintain the export market of flaxseed. Identified accessions with lower cadmium accumulation than current varieties but verification is required in 1995 tests (funded by United Grain Growers Ltd. and M.I.I.) (B-19).

Dr. Kenaschuk identified flax genotypes with significant differences in neutral and acidic fractions of polysaccharides in flax. The research demonstrated a potential for use of flaxseed gum as substitutes for guar and arabic gums in food products and an opportunity to improve by breeding the quality and yield of flaxseed gum (Da-36, De-43, De-45, De-46, C-30, C-33).

## CREATIVITY

Significant advances have been made in the breeding of high oil content and high linolenic

acid content in flax. Oil content was increased to over 50% by recurrent selection while linolenic acid content was increased to over 65%.

Identified growth stages in the development of an early and late maturing flax variety.

In collaboration with the plant pathologist:

- proposed the use of reaction to an appropriate rust race for testing purity of flax varieties. Procedure has been used by Plant Products to test purity of pedigree seed of flax varieties.
- identified postseedling resistance as an alternative source of resistance to rust in flax.
- developed a more durable resistance to rust in flax by developing varieties with more than one effective gene for resistance.
- developed a protocol for operation of the flax containment rust lab to ensure complete quarantine conditions and prevent spore escape from the lab (Aa-19).

In collaboration with the agronomist:

- proposed the use of desiccants as an aid to promote retting in fiber flax.
- developed a laboratory technique to select flax genotypes for resistance to seed weathering.

In collaboration with oil quality biologist:

- identified flax genotypes with low cyanogenic glucosides and with different fractions (acidic and neutral) of polysaccharides.
- initiated research to develop PCR molecular markers for the identification of low levels of glucosides in segregating flax populations.

## RECOGNITION

### International

- Approached by 13 seed companies from the U.K. and Europe on the availability of flax varieties and experimental lines for commercialization. Provided unregistered lines to 9 companies for evaluation. Collaborated with a seed company, Sharpes International Inc. in the U.K., in the evaluation of flax experimental lines in the U.K. and Europe (under a collaborative research agreement, 1992-1995).
- Contacted frequently by scientists in the U.K. and numerous European countries for exchanging flax germplasm.
- Scientific advisor to the Flax Institute of the United States (1966-1995). Participates in work planning meetings at the Institute's annual meetings and participated in a flax research planning and coordinating conference.



- Reviewer for the Crop registration Committee for oilseed crops of the American society of Agronomy (1974-1993).

## **National**

### **Awards:**

- Honorary life member of the Canadian Seed Growers' Association in "recognition of services to the Association and contribution to Canadian Agriculture."
- Honorary life member of the Canadian Seed Growers' Association, Manitoba Branch, in "recognition of valuable service to the seed industry of Manitoba."
- Governor-General Commemorative Medal for the 125 Anniversary of Canadian Confederation on behalf of the "flax team" of the establishment.

### **National recognition is indicated by the appointments to a number of advisory committees and working groups.**

- Chairperson of the Sub-committee on Oilseed Crops of the Associate Committee on Plant Breeding, NRC (1966-1970).
- Member of the Oilseed Sub-Committee of the Prairie Registration Recommending committee for Grain.
- Member of the Expert Committee on Grain Breeding for two 3-year terms.
- Member of the Oilseed and Special Crops Sub-Committee of the Manitoba Lead Science Committee of MASCC. Elected chairperson on three occasions. Member of the Crop Science Lead committee for two years. Served as crop summarizer for flax for the Manitoba publication "Field Crops Recommendations".
- Associate director of the Canadian Seed Growers' Association.
- Scientific advisor to the Flax Growers Western Canada (1975-1995). Frequently invited to present papers at annual meetings. Participated in a symposium to determine research priorities in flax.
- Member of the Research and Technical Committee of the Flax Council of Canada (1987-1995) representing the Research Branch. Participated in annual review of research priorities and research proposals for funding by the Council.
- Ex-officio member of the Advisory Committee of the Seed Increase Unit of the Indian Head Experimental Farm (1992-1994).
- Member of a Task Group, "Cereals and Oilseed (Export), Crop Production Technology) by the Manitoba Agriculture Steering committee.
- Member of a committee of the Regional Development Branch to develop a commodity based development strategy paper for grains and oilseed crops for Manitoba.

**National recognition also indicated by invitations to contribute to writing of bulletins and books.**

- revision of the national bulletin on "Growing Flax" by the flax council of Canada.
- chapter on flax breeding and genetics in "Oilseeds and Pulse Crops in Western Canada" published by Western Cooperative Fertilizers Ltd.
- sections on plant breeding in flax in the "Grains and Oilseeds" by the International Grains Institute.
- sections pertaining to flax in the book "Principles and Practices of Commercial Farming" published by the University of Manitoba.
- chapter on cultivars and agronomic aspects in the book "Flaxseed in Human Nutrition" published by the American Oil Chemists' Society (with Dr. B.D. Oomah).

**Appointed coordinator of research projects:**

- New Crops Development project on hybrid canola development at the University of Manitoba.
- New Crops Development Flax Growers Western Canada project on development of management practices and evaluation of varieties for fiber flax production in western Canada.

**Approached by industry to develop flax varieties with specific oil and seed characteristics to meet market demand.**

- High oil content by Parsons Seeds Ltd., Beeton, ON.
- High linolenic acid content by NorCan Seeds Ltd., Fisher Branch, MB.
- Yellow seed color by Golden Flax Ltd., Fort Qu'Appelle, SK.
- Development of gamma linolenic acid in flax by NorCan Seeds Ltd./Spectrum Marketing Inc.

## **LEADERSHIP**

### **Scientific Leadership**

As a member of the Research and Technical Committee of the Flax Council of Canada, established priorities for research in flax and reviewed numerous research proposals for funding to meet the priorities (1987-1995).

Participated in "Flax Research Priorities" conferences organized by the Flax Council of Canada to determine research priorities in plant breeding, crop management and crop

utilization (1988) and crop breeding and crop management (1995). Made recommendations on the priorities in the development of flax varieties by plant breeding.

Frequently consulted by growers, industry, provincial agriculture specialists and scientists on problems related to flax varieties and crop management. Consulted by 13 seed companies in the U.K. and Europe on the merits and availability of flax varieties and experimental lines for commercialization in six countries.

Frequently invited to conduct tours, address meetings of growers and/or industry at local, regional and national level.

Participated in the "Flax Research Planning and coordinating" conference held by the Flax Institute of the United States. The conference resulted in the coordination of breeding programs in Canada and the United States in the development of rust resistance in flax varieties.

Participated in Agriculture Canada's "Work Planning Meeting" and presented a review and recommendations on flax breeding and evaluation (1975). Participated in Agriculture Canada's "Western Oilseed Review" (1981) which established research priorities in oilseed crops including flax.

Served as project coordinator for the New Crop Development Fund "Hybrid Canola Varieties for Western Canada" at the University of Manitoba (1981-1982). Assessed the progress of the project.

### **Degree of Influence**

As a member of the Prairie Regional Registration Committee and Expert committee on grain Breeding, had a strong influence on flax breeding, evaluation and registration of varieties. As the coordinator of the flax cooperative test and chairperson of the flax "evaluation team", established guidelines for the evaluation process and minimum standards for registration of varieties. The minimum standards for yield, oil content and oil quality were progressively increased to ensure that new varieties are improvements for these traits.

As a member of the Oilseed and Special Crops Sub-Committee of the Manitoba Lead Committee of MASCC, had responsibility for developing flax variety and crop management recommendations in Manitoba. Research results on seeding rate, date and depth to maximize yield, variety performance in late seeding, the effect of canola residue on flax yield, rate and application time of desiccants, etc., were incorporated into recommendations. Also provided advice on varietal recommendations for Alberta and Saskatchewan.

Contributed to the writing and editing of the flax bulletin "Growing Flax in Canada" which covers all aspects of growing the flax crop. Completely revised the bulletin in 1968 and made further revisions in 1976. Coordinated the revision of the bulletin for the Flax Council of Canada in 1987 and contributed to the revision of the bulletin in 1992. The publication has been widely distributed in western Canada and many other countries in response to numerous requests.

Contributed to the Task Group "Cereal and Oilseeds (Export) Crop Production technology" of the Manitoba Agricultural Steering committee in identifying specific opportunities and/or constraints and potential initiatives to increase production of cereals, oilseed and special crops in Manitoba. Prepared a report for six non-cereal crops.

Contributed to a committee organized by the Regional Development Branch to develop a commodity based development strategy paper for Manitoba Grains and Oilseed section which was forwarded to ACDC.

### **Program Leadership**

As project leader in flax, had a major influence on the research activities in crop management, disease control and crop utilization. Instrumental in establishing research in: improving seeding and harvesting practices and seed quality; broadening the genetic base of rust resistance and the development of multigenic rust resistance; and reducing toxic factors in order to improve the safety of the use of flaxseed and oil in food products. Established close collaboration with colleagues to carry out these research activities and was involved in the planning and implementation of research. Ensured that research activities were directed to the needs of the flax industry and that research findings were reported directly to the clients.

Project leader of the breeding program in buckwheat and field peas (October 1965 - June 1967). Supervised the field pea breeding program for one year during the absence of the breeder.

As Head of the Oilseed Crops/Breeding Section (1966-1995), provided leadership to from 4 to 9 scientists involved in research in breeding, disease control, weed control and crop management, primarily in flax, field peas and sunflowers, but also buckwheat, corn and soybeans.

As member of the Executive Committee of the establishment (1967-1995), had an influence on all research programs by: participating in annual program reviews; review of new study outlines; determining priorities for purchasing scientific and field equipment; managing land resources used for research; and supervising labour resources.

Served as acting director frequently with delegated signing authority and on a full-time basis for seven months with full managerial responsibility. Signatory of Departmental Bank Account since 1986.

Served as scientist in charge of the Portage la Prairie Sub-Station (1979-1980). Managed land, labour and equipment resources used for research activities.

Served on selection boards for four scientists and chaired a board for a biologist position; numerous selection boards for GLT, EG and CR positions; and classification boards for GLT and EG positions.

Served as chairman of establishment's Land (1969-1995) and Labour (1988-1995) Committees. The Land committee is responsible for annual allocation of land for research purposes, development of rotation of crops and management practices to promote conservation of soil and providing a good seedbed for research plots. The Labour Committee is responsible for developing applications for funding to government employment programs, administering and coordinating labour resources provided from funding from industry, growers associations and government employment programs. These sources provided funding of more than \$85,000 to support research programs in 1994.

Member of the establishment's Transportation Committee (1983-1995) and Union-Management Committee (1990-1995).

Instrumental in developing collaborative research agreements (average annual funding \$120,000) with:

- United Grain Growers Ltd. in the development of solin varieties
- Parsons Seeds Ltd., Beeton, ON, in the development of high oil varieties
- Golden Flax Ltd., Fort Qu'Appelle, SK, in the development of yellow-seeded flax varieties
- NorCan Seeds Inc., Fisher Branch, MB, in the improvement of linolenic acid content in flax (M.I.I.)
- Parsons Seeds Ltd., Beeton, ON/Sharpes International Ltd. in the evaluation of flax lines from the Morden breeding program for commercialization in the U.K. and Europe
- INTA, Argentine - Exchange of flax germplasm
- United Grain Growers Ltd. in the development of flax germplasm for reducing toxic compounds, i.e. cyanogenic glucosides, cadmium and resistance to fusarium wilt (M.I.I.)

Instrumental in obtaining funding from the Flax Council of Canada for:

- improving harvesting practices and seed quality in flax
- development of molecular markers for cyanogenic glucosides and other deleterious quality factors in flax (M.I.I.)

### SCOPE OF DECISION MAKING

Appointed head of the Crop Breeding Section in 1966, involving scientists in breeding, pathology, disease control, weed control and crop management for buckwheat, sunflowers, field peas, field corn and soybeans as well as flax. Under Morden organizational structure, the Section Head also acts as Program Leader. The number of scientists within section ranged from 4 to 8. As Section Head and Program Leader, has responsibility for interpreting direction from management into research programs for scientists within section. As well, is instrumental in providing overall direction for flax development program involving three scientists and one biologist. Reviews project proposals from scientists within section prior to submission to management for approval. Requests for equipment and manpower originating from within section are prioritized before forwarding to management for decision making by Executive Committee.

Appointed to member of Morden Station Executive Committee in 1968 and in this capacity, had an influence on all research programs and Centre operations as well as decisions regarding purchasing scientific and field equipment, priorities for staffing of new or vacant positions and management of labour and land resources at the establishment. Many operational decisions at Morden are made by the Executive Committee, ie conference travel, seasonal manpower allotments, minor construction, equipment purchase, etc. As member of Executive Committee, provided criticism and support for Centre research studies during pilot of new Study Management System.

Served as acting Director frequently during absence of Director and on a full time basis for 7 months in 1992 with full managerial responsibility (level 4 authority). Has been a signatory for the Departmental Bank Account since 1986.

## LIST A - INNOVATION

- |     |      |   |
|-----|------|---|
| A-1 | 1975 | Developed the flax variety Dufferin with resistance to the new rust races (370, 371) which first appeared in 1973. All widely grown varieties were susceptible to the new races and the release of Dufferin averted yield losses from rust.   |
| A-2 | 1981 | Developed the flax variety McGregor; higher yield potential (5%) than Dufferin and much improved lodging resistance. First Canadian variety with two effective genes ( $L^6$ , $K^1$ ) for resistance to rust. Used as a parent for development of the flax varieties, Flanders and AC McDuff, and the solin varieties, Linola 947 and 989. |
| A-3 | 1982 | Developed the flax variety, NorLin; earlier maturing than McGregor with the same yield potential but much more suited to late seeding. Widely adapted and, since its release, grown, on average, on 30% of the flax acreage in the prairies.  |
| A-4 | 1984 | Developed the flax variety, NorMan; similar maturity as NorLin but higher yield potential (3%) in Manitoba and higher oil content (1 percentage point). Extensively grown in Manitoba (over 30% of the flax acreage) since its release.   |
| A-5 | 1991 | Developed the flax variety, AC Linora; similar maturity as NorLin but higher yield potential (6%), higher oil content (2 percentage points), higher oil quality (4.5 iodine units) and more resistance to fusarium wilt; multigenic ( $L^6$ , $K^1$ ) rust resistance.  |
| A-6 | 1993 | Developed the flax variety, AC McDuff; similar yield potential as AC Linora and Flanders in Manitoba but has higher oil content (2 percentage points) and much more resistant to lodging.   |
| A-7 | 1993 | Developed the flax line, FP 1001, which has significantly higher linolenic acid content (5.7 percentage points) than commercially grown varieties. FP 1001 is grown for its oil which is marketed as a source of alpha linolenic acid in the health food trade.   |
| A-8 | 1994 | Developed the flax variety, AC Emerson, which has much higher tolerance to chlorosis, a common nutritional imbalance condition of flax in Manitoba, than commercially grown varieties; higher oil quality (2-6 iodine units), larger seed size and improved seedling vigor than current varieties   |

- 
- |      |      |   |
|------|------|---|
| A-9  | 1994 | Developed two flax varieties, Peak (FP 884) and Gold Merchant (FP 897), which are listed in NIAB list of plant varieties. Commercially grown in the U.K. in 1995. |
| A-10 | 1995 | Developed the flax variety, Klasse (FP 944), a dual purpose type, suitable for both oil and fiber production. Commercially grown in the U.K. in 1995.             |



## LIST B - COOPERATIVE RESEARCH

- |      |             |   |
|------|-------------|---|
| B-1  | 1966 - 1995 | Evaluation of flax breeding lines with North Dakota State Univ., Fargo, N.D. (1966-1996), Univ. of Minnesota, St. Paul, Minnesota (1978-1985), USDA, Fargo, N.D. (1966-1996) and South Dakota State Univ., Brookings, S.D. (1979-1995). The program has resulted in the exchange of valuable germplasm. |
| B-2  | 1978-1981   | Development of fiber flax production in western Canada with Flax Growers, Western Canada and the Saskatchewan Research Council. Production methods for fiber production were determined and suitable varieties identified.  |
| B-3  | 1978-1984   | Development of flax varieties for the brown soils of Saskatchewan with the Crop Development Centre, Univ. of Saskatchewan, Saskatoon. The program resulted in the registration of two varieties, Flanders and Somme (1989).   |
| B-4  | 1981-1995   | Development of early maturing flax varieties for northern areas of the prairies with the Beaverlodge Research Centre (1981-1984) and the Melfort Research Centre (1984-1995).   |
| B-5  | 1983-1984   | Evaluation of preharvest desiccation as an aid to retting of fiber flax with Flax Growers Western Canada. Funded by New Crop Development Fund (Ag. Canada).   |
| B-6  | 1987-1991   | Evaluation of Canadian unregistered flax lines in the UK and Europe with nine Canadian seed companies and their affiliated seed companies in the UK and Western European countries.   |
| B-7  | 1988-1990   | Improvement of harvesting practices and seed quality in flax. Funded by the Flax Council of Canada.   |
| B-8  | 1989-1990   | Determination of the effects of herbicides, desiccants, stages of maturity and retting on fiber quality with Ecusta Fibers Ltd., North Carolina.  |
| B-9  | 1989-1993   | Development of management practices and tolerant varieties to reduce yield losses from chlorosis with Manitoba Agriculture and four flax growers.   |
| B-10 | 1989-1995   | Development and evaluation of solin type varieties with United Grain Growers Ltd./Biotechnica Ltd.  |

- 
- |      |                    |  |
|------|--------------------|--|
| B-11 | 1989-1995          | Development of flax varieties with yellow seed coat for the health food trade and the baking industry with Golden Flax Ltd., Fort Qu'Appelle, SK. Funded by the Saskatchewan Agriculture Development Fund.   |
| B-12 | 1990-1992          | Determination of the effect of the potato aphid on oilseed flax and stage specific threshold for control with the Winnipeg Research Centre.  |
| B-13 | 1990-1995          | Development of flax varieties with very high oil content. Funded by Parsons Seeds Ltd., Beeton, ON.  |
| B-14 | 1991-1993,<br>1995 | Development of flax varieties with high linolenic acid content for the health food trade. Funded by NorCan Seeds Inc., Fisher Branch, MB and M.I.I.  |
| B-15 | 1993               | Evaluation of the effect of crop rotation on cadmium accumulation in flax and durum wheat with the Grain Research Lab, Winnipeg, and the Dept. of Soil Science, Univ. of Manitoba, Winnipeg.                 |
| B-16 | 1994               | Evaluation of flax varieties for carotenoid pigment content with Grain Research Lab., Winnipeg, MB.  |
| B-17 | 1992-1995          | Evaluation of flax lines from the Morden breeding program for commercialization in the UK and Europe with Parsons Seeds Ltd., Beeton, ON, and Sharpes International Ltd., UK.                                |
| B-18 | 1994-1995          | Development of genetic molecular markers for screening for deleterious quality factors, eg. cyanogenic glucosides in flax with the Winnipeg Research Centre. Funded by the Flax Council of Canada and M.I.I. |
| B-19 | 1995               | Development of flax germplasm for low cadmium accumulation, resistance to fusarium wilt, high oil content, etc., with United Grain Growers Ltd. (M.I.I.).  |
| B-20 | 1995               | Development of flax varieties with very high linolenic acid content for the health food market. Funded by NorCan Seeds Inc., Fisher Branch, MB. and M.I.I.   |

## LIST C - TECHNOLOGY TRANSFER

- |      |      |  |
|------|------|--|
| C-1  | 1966 | The 1966 status of varieties and rust of flax in Canada. Ann. Flax Institute, U.S.   |
| C-2  | 1973 | A new and dangerous flax rust, race 370, and future of flax varieties. Man. Agron. Conf.                                     |
| C-3  | 1974 | Flax varieties and flax breeding progress. Flax Growers Western Canada Ann. Meeting.   |
| C-4  | 1974 | Flax breeding programs in Canada. Ann. Flax Institute, U.S.  |
| C-5  | 1975 | Flax breeding and genetics. Oilseed and Pulse Crops Symposium. Western Cooperative Fertilizers Ltd.                          |
| C-6  | 1975 | Developing flax varieties. Flax Growers Western Canada Symposium.  |
| C-7  | 1976 | Distribution of rust races in western Canada in 1975 and flax varieties for 1976. Can. Barley and Oilseed Conf.              |
| C-8  | 1976 | Performance of flax varieties and potential new varieties. Flax Growers Western Canada Ann. Meeting.                         |
| C-9  | 1979 | Desiccation research in flax and sunflowers. Man. Agron. Conf.   |
| C-10 | 1979 | Occurrence of postseedling resistance to <i>Melampsori lini</i> in flax. Can. Phytopath. Soc.                                |
| C-11 | 1980 | Variation in postseedling rust resistance in flax varieties. Ann. Flax Institute, U.S.                                       |
| C-12 | 1981 | Development of new varieties in flax and soybeans in Canada. Canadian Grain Institute's International Grain Industry Course. |
| C-13 | 1982 | A summary of flax research in Manitoba. Ann. Flax Institute, U.S.  |
| C-14 | 1982 | A new rust resistant gene at the K. locus. Ann. Flax Institute, U.S.   |
| C-15 | 1983 | Varietal development in flax. Flax Growers Western Canada Ann. Meeting.  |
| C-16 | 1983 | Merits of new flax varieties. Pulse and Oilseed Crops Days.  |

- 
- |      |      |   |
|------|------|---|
| C-17 | 1984 | Postseedling rust resistance of flax varieties resistant to North American races. Ann. Flax Institute, U.S.                             |
| C-18 | 1985 | New flax varieties. Flax Growers Western Canada Ann. Meeting.   |
| C-19 | 1986 | Performance of flax blends. Ann. Flax Institute, U.S.   |
| C-20 | 1986 | Correlation between flax varietal levels of postseedling rust resistance to race 22 and 79. Ann. Flax Institute, U.S.                   |
| C-21 | 1987 | Flax varietal performances and recommendations. Flax Growers Western Canada Ann. Meeting.   |
| C-22 | 1988 | Response of new flax varieties to plant density. Ann. Flax Institute, U.S.  |
| C-23 | 1988 | Response of varieties to temperature and light quality. Ann. Flax Institute, U.S.   |
| C-24 | 1990 | Agronomic characteristics of low linolenic flax populations produced by backcrossing 'zero' to Canadian varieties. Flax Institute, U.S. |
| C-25 | 1990 | Seed yield and quality of flax varieties at different maturity stages. Flax Institute, U.S.   |
| C-26 | 1990 | Effect of varieties, herbicides and maturity on quality of oilseed flax fiber. Flax Institute, U.S.                                     |
| C-27 | 1990 | Factors affecting choice of a flax variety. Flax Growers Western Canada Ann. Meeting.   |
| C-28 | 1991 | Seed quality and quality of flax swathed or desiccated at different stages of maturity. Manitoba Agri-Forum.                            |
| C-29 | 1992 | Tolerance of flax to frost, seed weathering, capsule loss, and chlorosis. Flax Institute, U.S.  |
| C-30 | 1992 | Relationship between carbohydrates and cyanogenic compounds in flaxseed. Flax Institute, U.S.   |
| C-31 | 1992 | Flax wilt affected by fall application of trifluralin. Flax Institute, U.S.   |

- 
- |      |      |  |
|------|------|--|
| C-32 | 1992 | Performance of new flax varieties. Flax Growers Western Canada Ann. Meeting.               |
| C-33 | 1994 | Flaxseed gum: genotype chemical structure and rheological properties. Flax Institute, U.S. |
| C-34 | 1994 | Safety considerations of flaxseed and flaxseed components. Flax Institute, U.S.            |
| C-35 | 1994 | Flax varietal reaction to pasmo under several tillage systems. Flax Institute, U.S.        |
| C-36 | 1995 | Performance of new flax varieties. Flax Growers Western Canada Ann. Meeting.               |

## LIST D - RESEARCH PUBLICATIONS

### List Da - Recognized Scientific Journals

- Da-1 **Kenaschuk, E.O.**, R.G. Anderson and D.R. Knott. 1959. The inheritance of resistance to race 15B of stem rust in ten varieties of durum wheat. *Can. J. Plant Sci.* 39: 316-328.
- Da- 2 Ali-Khan, S.T. and **E.O. Kenaschuk**. 1970. Trapper field peas. *Can. J. Plant Sci.* 50: 508.
- Da- 3 Ali-Khan, S.T. and **E.O. Kenaschuk**. 1971. Tempest buckwheat. *Can. J. Plant Sci.* 51: 433.
- Da- 4 **Kenaschuk, E.O.** 1976. Dufferin, a new flax variety. *Can. J. Plant Sci.* 57: 977-978.
- Da- 5 **Kenaschuk, E.O.** 1979. Registration of Dufferin Flax. *Crop Sci.* 20: 284-285, Reg. No. 33.
- Da- 6 **Kenaschuk, E.O.** 1979. Registration of Linott Flax. *Crop Sci.* 20: 285, Reg. No. 34.
- Da- 7 Hoes, J.A. and **E.O. Kenaschuk**. 1980. Post-seedling resistance to rust. *Can. J. Plant Path.* 2: 125-130.
- Da- 8 Gubbels, G.H. and **E.O. Kenaschuk**. 1981. Desiccation of flax with diquat. *Can. J. Plant Sci.* 61: 575-581.
- Da- 9 Hoes, J.A. and **E.O. Kenaschuk**. 1986. Gene K<sup>1</sup> of Raja flax: A new factor for resistance to rust. *Phytopathology* 76(10): 1043-1045.
- Da-10 **Kenaschuk, E.O.** and J.A. Hoes. 1986. McGregor flax. *Can. J. Plant Sci.* 66: 175-176.
- Da-11 **Kenaschuk, E.O.** and J.A. Hoes. 1986. NorLin flax. *Can. J. Plant Sci.* 66: 171-173.
- Da-12 **Kenaschuk, E.O.** and J.A. Hoes. 1986. NorMan flax. *Can. J. Plant Sci.* 66: 993-995.
- Da-13 Gubbels, G.H. and **E.O. Kenaschuk**. 1987. Performance on pure and mixed stand of flax cultivars. *Can. J. Plant Sci.* 67: 797-802.

- Da-14 Gubbels, G.H. and E.O. Kenaschuk. 1989. Agronomic performance of flax grown on canola, barley and flax stubble with and without tillage prior to seeding. *Can. J. Plant Sci.* 69: 31-38 (Jan. 1989).
- Da-15 Gubbels, G.H. and E.O. Kenaschuk. 1989. Effect of spring seedling residues on the agronomic performance of subsequent flax and barley crops seeded with and without prior tillage. *Can. J. Plant Sci.* 69: 151-159 (Jan. 1989).
- Da-16 Gubbels, G.H. and E.O. Kenaschuk. 1989. Effect of seeding rate on plant and seed characteristics of new flax cultivars. *Can. J. Plant Sci.* 69: 791-795 (July 1989).
- Da-17 Rowland, G.G., E.O. Kenaschuk and R.S. Bhatti. 1990. Somme Flax. *Can. J. Plant Sci.* 90: 543-544.
- Da-18 Rowland, G.G., E.O. Kenaschuk and R.S. Bhatti. 1990. Flanders Flax. *Can. J. Plant Sci.* 90: 545-546.
- Da-19 Rashid, K.Y. and E.O. Kenaschuk. 1991. A flax rust containment research laboratory at Agriculture Canada Research Station, Morden, Manitoba. *Can. J. Plant Pathol.* 13: 93-95.
- Da-20 Hoes, J.A. and E.O. Kenaschuk. 1992. Host-pathogen specificity in postseedling reaction of Linum usitatissimum to Melampsora lini. *Can. J. Bot.* 70: 1168-1174.
- Da-21 Oomah, B. Dave, Giuseppe Mazza, and Edward O. Kenaschuk. 1992. Cyanogenic compounds in flaxseed. *J. Agric. Food Chem.* Vol. 40, No. 8: 1346-1348.
- Da-22 Rashid, K.Y. and E.O. Kenaschuk. 1992. Genetics of resistance to rust in the flax cultivars Vimy and Andro. *Can. J. Plant Pathol.* 14: 207-210.
- Da-23 Atlin, G.N., E.O. Kenaschuk and D.J. Lockwood. 1992. Single-row plots for agronomic evaluation of flax (Linum usitatissimum L.) lines. *Can. J. Plant Sci.* 72: 997-1000.
- Da-24 Bonner, D.M., G.H. Gubbels and E.O. Kenaschuk. 1993. Frost tolerance of maturing flax. *Can. J. Plant Sci.* 73: 167-170.
- Da-25 Gubbels, G.H. and E.O. Kenaschuk. 1993. Capsule closure and seed discoloration in flax from exposure to various moisture and temperature conditions. *Can. J. Plant Sci.* 73: 155-158.

- Da-26 Gubbels, G.H., D.M. Bonner and E.O. Kenaschuk. 1993. Effect of swathing and desiccation time on seed yield and quality of flax. *Can. J. Plant Sci.* 73: 397-404.
- Da-27 Kenaschuk, E.O. and K.Y. Rashid. 1993. AC Linora flax. *Can. J. Plant Sci.* 73: 839-841.
- Da-28 Rashid, K.Y. and E.O. Kenaschuk. 1993. Effect of trifluralin on fusarium wilt in flax. *Can. J. Plant Sci.* 73: 893-901.
- Da-29 Gubbels, G.H., D.M. Bonner and E.O. Kenaschuk. 1993. Effect of time of swathing and desiccation on plant drying, seed color and germination of flax. *Can. J. Plant Sci.* 73: 1001-1007.
- Da-30 Gubbels, G.H., D.M. Bonner and E.O. Kenaschuk. 1994. Use of desiccants to reduce frost damage in immature flax. *Can. J. Plant Sci.* 74: 121-123.
- Da-31 Gubbels, G.H., D.M. Bonner and E.O. Kenaschuk. 1994. Indicators for optimum stage for swathing oilseed flax. *Can. J. Plant Sci.* 74: 323-325.
- Da-32 Gubbels, G.H., D.M. Bonner and E.O. Kenaschuk. 1994. Effect of frost injury on quality of flax seed. *Can. J. Plant Sci.* 74: 331-333.
- Da-33 Kenaschuk, E.O. and K.Y. Rashid. 1994. AC McDuff flax. *Can. J. Plant Sci.* 74: 815-816.
- Da-34 Rashid, K.Y. and E.O. Kenaschuk. 1994. Genetics of resistance to rust in six flax cultivars. *Can. J. Plant Pathol.* 16: 266-272.
- Da-35 Wise, I.L., R.J. Lamb and E.O. Kenaschuk. 1995. Effects of the potato aphid *Macrosiphum Euphorbica* (Thomas) (Homoptera: Aphidial) on oilseed flax, and stage-specific thresholds for control. *The Canadian Entomologist.* 127: 213-224.
- Da-36 Oomah, B. Dave, Edward O. Kenaschuk, Wuwei Cui and Giuseppe Mazza. 1995. Variation in the composition of water-soluble polysaccharides in flax seed. *J. Agric. Food Chem.* Vol. 43, No. 6: 1484-1488.
- Da-37 Oomah, B. Dave, Edward O. Kenaschuk, Giuseppe Mazza. 1995. Phenolic acids in flaxseed. *J. Amer. Chemical Society* (in press).
- Da-38 Oomah, B. Dave, Giuseppe Mazza and Edward O. Kenaschuk. 1995. Dehulling characteristics of flaxseed. *J. Food Science and Technology* (in press).



Da-39 Oomah, B. Dave, Giuseppe Mazza and **Edward O. Kenaschuk**. 1995. Flavonoids in flaxseed. *Euphytica* (in press).

Da-40 **Kenaschuk, E.O.**, K.Y. Rashid and G.H. Gubbels. 1995. AC Emerson flax. *Can. J. Plant Sci.* (in press).

### List Db - Departmental Reports

Db-1-18 **Kenaschuk, E.O.** 1965-82. Report on cooperative tests of flax varieties. Min. Expert Committee on Grain Breeding.

Db-19 **Kenaschuk, E.O.** 1968. Growing Flax. CDA Publ. 545. 19 pp.

Db-20 **Kenaschuk, E.O.** 1976. Growing flax. Agric. Can. Publ. 1577 (revised), pp. 16

Db-21 **Kenaschuk, E.O.** 1983. Report on cooperative tests of flax varieties, 1982. Minutes Expert Comm. on Grain Breeding, pp. 575-598.

Db-22 Hoes, J.A. and **E.O. Kenaschuk**. 1983. Guidelines for desirable disease resistance (flax). Minutes 6th Ann. Mtg. Expert Comm. on Grain Diseases, p. 49.

Db-23 **Kenaschuk, E.O.** 1984. Report on cooperative tests of flax varieties, 1983. Minutes Expert Comm. on Grain Breeding, pp. 512-536.

Db-24 Anonymous. 1984. Preharvest desiccation as an aid to retting of fibre flax, Research Report 1983-84, 36 pp. (Prepared on behalf of Flax Growers Western Canada).

Db-25 **Kenaschuk, E.O.** 1985. Report on cooperative tests of flax varieties, 1984. Minutes, Expert Comm. on Grain Breeding.

Db-26 **Kenaschuk, E.O.**, G.H. Gubbels, J.A. Hoes, et al. 1986. Growing flax in Canada. Flax Council.

Db-27 **Kenaschuk, E.O.** 1986. Report on Cooperative Tests of flax varieties, 1985. Minutes, Expert Committee on Grain Breeding.

Db-28 **Kenaschuk, E.O.** 1987. Report on Cooperative tests of flax varieties 1987. Minutes, Expert Committee on Grain Breeding.

Db-29 Gubbels, G.H., J.A. Hoes, G. Friesen, **E.O. Kenaschuk**, A. Arthur, K. Panchuk, G. Rowland, G. Hanley and D. Tomasiewicz. 1987. Growing flax in Canada. The Flax Council of Canada. 1987. 22 pp.

- Db-30 **Kenaschuk, E.O.** 1988. Report on Cooperative tests of flax varieties 1988. Minutes, Expert Committee on Grain Breeding.
- Db-31 **Kenaschuk, E.O.** 1989. Report on Cooperative tests of flax cultivars. Minutes, Expert Committee on Grain Breeding.
- Db-32 **Kenaschuk, E.O.** 1990. Report on Cooperative tests of flax cultivars. Minutes, Expert Committee on Grain Breeding.
- Db-33 **Kenaschuk, E.O.** 1991. Report on the Flax Cooperative Test. Minutes of the 2nd Annual Meeting, Prairie Registration Recommending Committee for Grain, Special Crops and Oilseed Crops.
- Db-34 (19 authors). 1992. Growing flax. The Flax Council of Canada. 28 pp.
- Db-35 **Kenaschuk, E.O.** 1992. Report on the Flax Cooperative Test. Minutes of the 3rd Annual Meeting, Prairie Registration Recommending Committee for Grain, Special Crops and Oilseed Crops.
- Db-36 **Kenaschuk, E.O.** 1993. Report on the Flax Cooperative Test. Minutes of the 4th Annual Meeting, Prairie Registration Recommending Committee for Grain (Oilseed Crops Sub-Committee).
- Db-37 **Kenaschuk, E.O.** 1994. Report of the Flax Cooperative Test. Minutes of the 5th Annual Meeting, Prairie Registration Recommending Committee for Grains (Oilseed Crops Sub-Committee).
- Db-38 **Kenaschuk, E.O.** 1995. Report of the Flax Cooperative Test. Minutes of the 6th Annual Meeting, Prairie Registration Recommending Committee for Grains (Oilseed Crops Sub-Committee).

#### List Dc - Special Publications

- Dc-1 Gubbels, G.H. and **E.O. Kenaschuk.** 1984. Preharvest desiccation as an aid to retting of fiber flax. Research Report, 1983-1984. 36 pp. (Prepared on behalf of Flax Growers Western Canada).
- Dc-2 Gubbels, G.H., D.M. Bonner and **E.O. Kenaschuk.** 1991. Improvement of the quality of flaxseed. Research Report, 1988-1991. 4 pp. (Funded by Flax Council of Canada).

- Dc-3 Gubbels, G.H. and **E.O. Kenaschuk**. 1992. Sustainable management systems for special crops. Research Report, 1991-1992. 20 pp. (Funded by Environmental Sustainability Initiative).

#### List Dd - Books, chapters

- Dd-1 **Kenaschuk, E.O.** 1974. Chapter 5. Field Crops - Flax. In: Principles and Practices of Commercial Farming. Faculty of Agriculture, Univ. of Manitoba, pp. 138-141, 154-155.
- Dd-2 **Kenaschuk, E.O.** 1975. Chapter 7. Flax Breeding and Genetics. In: Oilseeds and Pulse Crops in Western Canada. Symposium sponsored by Western Cooperative Fertilizers Ltd., Calgary, Alta. Ed. J.T. Harapiak. pp. 203-221. A comprehensive review of breeding methods in flax and literature review of research in breeding and genetics in flax; 92 references.
- Dd-3 **Kenaschuk, E.O.** 1977. Chapter 5. Field Crops - Flax. In: Principles and Practices of Commercial Farming. Faculty of Agriculture, Univ. of Manitoba, pp. 99, 106-107.
- Dd-4 **Kenaschuk, E.O.** 1982. Chapter D10. Oilseeds - Production, Flax. In: Grains and Oilseeds: Handling, Marketing and Processing. Canadian International Grains Institute, pp. 765-767, 773-776.
- Dd-5 **Kenaschuk, E.O.** 1993. Plant breeding programs for Canadian oilseeds. Chapter D10. Flaxseed. In: Grains and Oilseeds: Handling, Marketing and Processing. Canadian International Grains Institute, Winnipeg, MB. pp. 831-883 (Section pertaining to flax).
- Dd-6 Oomah, B.D. and **E. Kenaschuk**. 1995. Chapter 3. Cultivars and Agronomic Aspects. In: Flaxseed in Human Nutrition. Amer. Oil Chemists' Society. Ed. S.C. Cunnane and L.U. Thompson. pp. 43-55.
- Dd-7 **Kenaschuk, E.O.** and G.G. Rowland. 1995. Chapter 15. Flax. In: Harvest of Gold. The History of Field Crop Breeding in Canada. University of Saskatchewan, pp. 173-176.

#### List De - Conference Proceedings

- De-1 **Kenaschuk, E.O.** 1965. Agronomic and quality data for field pea varieties. Proc. Man. Agron. Conf., p. 17.

- De-2 **Kenaschuk, E.O.** 1966. Agronomic and quality data for flax varieties. Proc. Man. Agron. Conf., p. 14.
- De-3 Hoes, J.A. and **E.O. Kenaschuk.** 1966. The 1966 status of varieties and rust of flax in Canada. 36th Ann. Flax Inst. U.S., pp. 12-13.
- De-4 **Kenaschuk, E.O.** 1967. Agronomic and quality data for flax varieties. Proc. Man. Agron. Conf., pp. 23-24.
- De-5-7 **Kenaschuk, E.O.** 1968-70. Agronomic and quality data for flax varieties. Proc. Man. Agron. Conf., pp. 32-33.
- De-8 Hoes, J.A. and **E.O. Kenaschuk,** 1968. Disorders of flax in Manitoba in 1968. Can. Plant Dis. Surv. 48(4): 153.
- De-9-18 **Kenaschuk, E.O.** 1972-81. Agronomic and quality data for flax varieties. Proc. Man. Agron. Conf.
- De-19 **Kenaschuk, E.O.** and J.A. Hoes. 1973. A new and dangerous flax rust, race 370, and the future of flax varieties. Proc. Man. Agron. Conf., pp. 88-91.
- De-20 **Kenaschuk, E.O.** 1974. What's new in oilseed varieties - flax. Proc. Can. Barley & Oilseeds Conf., pp. 98-101.
- De-21 **Kenaschuk, E.O.** 1974. Present status of flax rust and flax varieties. Proc. Man. Agron. Conf., pp. 72-73.
- De-22 **Kenaschuk, E.O.** 1974. Flax breeding program in Canada. Proc. 44th Ann. Flax Inst. U.S., p. 24.
- De-23 Hoes, J.A. and **E.O. Kenaschuk.** 1974. Occurrence of flax rust in Canada in 1974, and varietal purity of 'Linott'. Proc. 44th Ann. Flax. Inst. U.S., p. 1.
- De-24 **Kenaschuk, E.O.** 1975. Developing flax varieties. Proc. Flax Growers Symposium, pp. 1-10.
- De-25 Hoes, J.A. and **E.O. Kenaschuk.** 1976. Distribution of rust races in western Canada in 1975 and flax varieties for 1976. Proc. Can. Barley & Oilseeds Conf., pp. 103-104.
- De-26 Gubbels, G.H., **E.O. Kenaschuk** and W. Dedio. 1979. Desiccation research in flax and sunflowers. Proc. Man. Agron. Conf., pp. 23-26.

- De-27 Hoes, J.A. and **E.O. Kenaschuk**. 1979. Occurrence of postseedling resistance to Melampsora lini in flax. Proc. Can. Phytopath. Soc., pp. 59-60 (Abstr.).
- De-28 Hoes, J.A. and **E.O. Kenaschuk**. 1980. Variation in postseedling rust resistance in flax cultivars. Proc. 48th Ann. Flax Inst. U.S., pp. 41-46.
- De-29 Gubbels, G.H. and **E.O. Kenaschuk**. 1980. Preharvest desiccation of flax with diquat. Proc. 48th Ann. Flax Inst. U.S., pp. 36-38.
- De-30 **Kenaschuk, E.O.** 1980. Agronomic and quality data for flax varieties. Proc. Man. Agron. Conf., pp. 52-53.
- De-31 **Kenaschuk, E.O.** 1982. A summary of flax research in Manitoba. Proc. 49th Ann. Flax Inst. U.S., pp. 71-73.
- De-32 Hoes, J.A. and **E.O. Kenaschuk**. 1982. A new rust resistance gene at the K-locus. Proc. 49th Ann. Flax Inst. U.S., pp. 58-60.
- De-33 Hoes, J.A. and **E.O. Kenaschuk**. 1984. Postseedling rust resistance of flax varieties resistant to North American races. Proc. 50th Annual Flax Inst., U.S., Jan. 1984, Fargo, N.D., pp. 38-42.
- De-34 Gubbels, G.H. and **E.O. Kenaschuk**. 1986. Performance of flax blends. Proc. 51st Ann. Flax Inst., U.S., pp. 31-34.
- De-35 Hoes, J.A. and **E.O. Kenaschuk**. 1986. Correlation between flax varietal levels of postseedling rust resistance to races 22 and 79. Proc. 51st Flax Inst., U.S., Fargo, N.D., Jan. 30-31, 1986.
- De-36 Gubbels, G.H. and **E.O. Kenaschuk**. 1988. Response of new flax cultivars to plant density. Proc. 52nd Ann. Flax Inst. U.S. pp. 28-29.
- De-37 **E.O. Kenaschuk** and G.H. Gubbels. 1988. Response of varieties to temperature and light quality. Proc. 52nd Ann. Flax Inst. U.S. pp. 7-14.
- De-38 Atlin, G.N., **E.O. Kenaschuk** and A.G. Green. 1990. Agronomic characteristics of low-linolenic flax populations produced by backcrossing 'zero' to Canadian cultivars. Proc. 53rd Flax Inst. U.S., pp. 77-81.
- De-39 Bonner, D.M., G.H. Gubbels and **E.O. Kenaschuk**. 1990. Seed yield and quality of flax harvested at different maturity stages. Proc. 53rd Flax Inst. U.S., pp. 116-121.

- De-40 Dixit, A.S., G.H. Gubbels and **E.O. Kenaschuk**. 1990. Effect of cultivars, herbicides and maturity on quality of oilseed flax fiber. Proc. 53rd Flax Inst. U.S., pp. 122-125.
- De-41 Bonner, D.M., G.H. Gubbels and **E.O. Kenaschuk**. 1991. Seed yield and quality of flax swathed or desiccated at different stages of maturity. Manitoba Agri-Forum, pp. 89-93.
- De-42 Gubbels, G.H., **E.O. Kenaschuk** and D.M. Bonner. 1992. Tolerance of flax to frost, seed weathering, capsule loss and chlorosis. Proc. 54th Flax Inst. U.S., pp. 131-136.
- De-43 Oomah, B.D., G. Mazza and E. Kenaschuk. 1992. Relationship between carbohydrates and cyanogenic compounds in flaxseed. Proc. 54th Flax Inst. U.S., pp. 59-66.
- De-44 Rashid, K.Y. and **E.O. Kenaschuk**. 1992. Flax wilt affected by fall application of trifluralin. Proc. 54th Flax Inst. U.S., pp. 137-139.
- De-45 Cui, W., **E.O. Kenaschuk** and G. Mazza. 1994. Flaxseed gum: genotype, chemical structure and rheological properties. Proc. of the 55th Flax Institute of the U.S., pp. 166-177.
- De-46 Cui, W., **E.O. Kenaschuk** and G. Mazza. 1994. Flaxseed gum: genotype, chemical structure and rheological properties. Proc. of the 55th Flax Institute of the U.S., pp. 166-177.
- De-47 Oomah, B.D., **E.O. Kenaschuk** and G. Mazza. 1994. Safety considerations of flaxseed and flaxseed components. Proc. of the 55th Flax Institute of the U.S., pp. 178-182.
- De-48 Rashid, K.Y., G.H. Gubbels and **E.O. Kenaschuk**. 1994. Flax varietal reaction to pasmo under several tillage systems. Proc. of the 55th Flax Institute of the U.S., pp. 206-210.
- De-49 Xue, A.G., T.D. Warkentin, K.Y. Rashid and **E.O. Kenaschuk**. 1995. Diseases of field peas in Manitoba and reaction of registered pea varieties to Ascochyta blight in 1994. Proc. of the Manitoba Agri-Forum 1995. Page 123-125.

**List Df - Other Publications**

- Df-1 Hoes, J.A. and **E.O. Kenaschuk**. 1968. Disorders of flax in Manitoba in 1968. Can. Plant Dis. Surv. 48: 153.
- Df-2 Ali-Khan, S.T. and **E.O. Kenaschuk**. 1971. New buckwheat variety. Canada Agric. 16(3): 16.
- Df-3 Ali-Khan, S.T., R.C. Zimmer and **E.O. Kenaschuk**. 1973. Reaction of pea introductions to Ascochyta root rot and powdery mildew. Can. Plant Dis. Surv. 53(3): 155-156.
- Df-4 Hoes, J.A. and **E.O. Kenaschuk**. 1973. New race of flax rust. Canadex (Field Crop Diseases) 148:632.
- Df-5 Gubbels, G.H. and **E.O. Kenaschuk**. 1976. Desiccation as a harvest aid for flax. Flax Growers, Western Canada, Newsletter No. 8, p. 3.
- Df-6 Gubbels, G.H. and **E.O. Kenaschuk**. 1978. Chemical desiccation as a harvest aid for flax. Focus on Research, Morden Res. Stn., p. 12.
- Df-7 Hoes, J.A. and **E.O. Kenaschuk**. 1979. Flax disease studies. Focus on Research, Morden Res. Stn., pp. 13-14.
- Df-8 Gubbels, G.H. and **E.O. Kenaschuk**. 1980. Desiccation. Flax Growers Newsletter No. 33, pp. 2-5.
- Df-9 Gubbels, G.H. and **E.O. Kenaschuk**. 1980. Desiccation as a harvest aid for flax. Canadex 148:55.
- Df-10 **Kenaschuk, E.O.** 1981. Development of new oilseed varieties in Canada - flax and soybeans. Presented at Canadian Int. Grains Inst. 16th International Grain Industry Course.
- Df-11 Gubbels, G.H., **E.O. Kenaschuk** and J.A. Hoes. 1983. Flax growth on soil containing seedling and mature crop residues. Focus on Research, Morden Res. Stn., p. 1.
- Df-12 Gubbels, G.H. and **E.O. Kenaschuk**. 1985. Blends of flax cultivars. Focus on Research, Morden Res. Stn., pp. 37-38.
- Df-13 **Kenaschuk, E.O.** 1985. New flax varieties. Agri-book Magazine 11(No. 6): 10.

- Df-14 Gubbels, G.H. and E.O. Kenaschuk. 1986. Effect of canola stubble on flax yields. Focus on Research, Morden Res. Stn., p. 33-35.
- Df-15 Gubbels, G.H. and E.O. Kenaschuk. 1987. Responses of new flax varieties to seeding rate. Focus on Research, Morden Res. Stn., pp. 38-39.
- Df-16 Gubbels, G.H. and E.O. Kenaschuk. 1987. Responses of flax to seedling residues. Focus on Research, Morden Res. Stn., pp. 39-42.
- Df-17 Gubbels, G.H. and E.O. Kenaschuk. 1987. Effect of canola stubble on flax seed yield. Canadex 148.22.
- Df-18 Gubbels, G.H. and E.O. Kenaschuk. 1988. Effect of canola stubble on flax yields. Flax Growers Newsletter, No. 69, pp. 12-13.
- Df-19 Gubbels, G.H. and E.O. Kenaschuk. 1989. Effect of seedling residues on flax yields. Canadex 152.21.
- Df-20 Gubbels, G.H. and E.O. Kenaschuk. 1989. Seeding rates for flax. Canadex 148.22.
- Df-21 Kenaschuk, E.O. 1990. Morden seeks to introduce flax cultivar FP 862. Focus on Research 1990: 64-66.
- Df-22 Gubbels, G.H. and E.O. Kenaschuk. 1991. Quality of oilseed flax fiber. Focus on Research 1991: 47.
- Df-23 Gubbels, G.H. and E.O. Kenaschuk. 1992. Weathering of flax seed. Focus on Research, Morden Res. Stn. pp. 46-47.
- Df-24 Gubbels, G.H. and E.O. Kenaschuk. 1992. Tolerance of flax to early fall frost. Focus on Research, Morden Res. Stn. pp. 51-53.
- Df-25 Gubbels, G.H. and E.O. Kenaschuk. 1992. Yield and quality reductions from early swathing and desiccation of flax. Focus on Research, Morden Res. Stn. pp. 48-51.
- Df-26 Rashid, K.Y. and E.O. Kenaschuk. 1992. Reduction in wilt incidence in flax by trifluralin (Treflan, Heritage, Rival. Focus on Research, Morden Res. Stn. pp. 53-55.
- Df-27 Kenaschuk, E.O. and K.Y. Rashid. 1993. High oil flax introduced (AC McDuff). Morden Res. Station Media Release No. 6-1993.



- Df-28 Gubbels, G.H., D.M. Bonner and **E.O. Kenaschuk**. 1994. Reductions in yield and quality from early swathing or desiccation of flax. Focus on Research, Morden Res. Sta. Publ. No. 94-16.
- Df-29 Gubbels, G.H., D.M. Bonner and **E.O. Kenaschuk**. 1994. Plant drying, seed color and germination of flax after swathing or desiccation. Focus on Research, Morden Res. Sta. Publ. No. 94-17.
- Df-30 Gubbels, G.H., D.M. Bonner and **E.O. Kenaschuk**. 1994. Indicators for optimum swathing stage for flax. Focus on Research, Morden Res. Sta. Publ. No. 94-18.
- Df-31 Gubbels, G.H., D.M. Bonner and **E.O. Kenaschuk**. 1994. Desiccation to reduce frost damage in immature flax. Focus on Research, Morden Res. Sta. Publ. No. 94-19.
- Df-32 Gubbels, G.H., D.M. Bonner and **E.O. Kenaschuk**. 1994. Tolerance of immature flax to frost. Focus on Research, Morden Res. Sta. Publ. No. 94-20.
- Df-33 Gubbels, G.H., D.M. Bonner and **E.O. Kenaschuk**. 1994. Quality of frozen flaxseed. Focus on Research, Morden Res. Sta. Publ. No. 94-21.
- Df-34 Gubbels, G.H. and **E.O. Kenaschuk**. 1994. Causes of weathering in flaxseed. Focus on Research, Morden Res. Sta. Publ. No. 94-22.
- Df-35 Gubbels, G.H., **E.O. Kenaschuk**, L.C. Halstead, and H. Tiessen. 1994. No-till plot seeder. Focus on Research, Morden Res. Sta. Publ. No. 94-23.
- Df-36 Gubbels, G.H. and **E.O. Kenaschuk**. 1994. Preharvest desiccation as an aid to retting of fiber flax. Focus on Research, Morden Res. Sta. Publ. No. 94-07.
- Df-37 Gubbels, G.H. and **E.O. Kenaschuk**. 1994. Phosphorus rate and placement in flax. Focus on Research, Morden Res. Sta. Publ. No. 94-06.
- Df-38 Gubbels, G.H., J. Ewanek and **E.O. Kenaschuk**. 1994. Flax chlorosis on calcareous soils in Manitoba. Focus on Research, Morden Res. Sta. Publ. No. 94-04.
- Df-39 Gubbels, G.H. and **E.O. Kenaschuk**. 1994. Seed weathering and boll loss of flax varieties. Focus on Research, Morden Res. Sta. Publ. No. 94-28.
- Df-40 Gubbels, G.H. and **E.O. Kenaschuk**. 1994. Growing flax without the use of herbicides. Focus on Research, Morden Res. Sta. Publ. No. 94-29.

Df-41 Daun, J.K. and **E.O. Kenaschuk**. 1994-95. Carotenoid pigment content in flax varieties. Grain Research Laboratory Activity Highlights, pp. 11-12.

Df-42 Xue, A.G., T.D. Warkentin, K.Y. Rashid, **E.O. Kenaschuk** and R.G. Platford. 1995. Diseases of field peas in Manitoba in 1994. Can. Plant Dis. Surv. 75(1):156-157.

## LIST F. RECOGNITION

- |      |           |  |
|------|-----------|--|
| F-1  | 1966      | Appointed Chairperson of the Oilseed and Special Crops Subcommittee of the Crop Science Lead Committee of MASCC.   |
| F-2  | 1966-1970 | Appointed Chairperson of the Sub-Committee on Oilseed Crops of the Associate Committee on Plant Breeding, NRC.   |
| F-3  | 1973      | Appointed Chairperson of the Oilseed and Special Crops Subcommittee of the Crop Science Lead Committee of MASCC.   |
| F-4  | 1974      | Invited by the Flax Institute of the United States to participate in a "Flax Research Planning and Co-ordinating" conference and to present a paper in flax breeding program in Canada.  |
| F-5  | 1975      | Invited by Western Cooperative Fertilizers Ltd. to participate in a symposium on "oilseed and Pulse Crops in Western Canada" and to present a paper on flax breeding and genetics.   |
| F-6  | 1975      | Invited to prepare a chapter on flax breeding and genetics on "Oilseeds and Pulse Crops in Western Canada" published by Western Cooperative Fertilizers Ltd.   |
| F-7  | 1975      | Invited to participate in a symposium on "Research in Flax" sponsored by the Flax Growers Western Canada. Presented a paper on "Developing Flax Varieties".  |
| F-8  | 1975      | Invited to revise sections pertaining to flax in the book "Principles and practices of commercial farming" published by the University of Manitoba.  |
| F-9  | 1977-1979 | Appointed member of the Expert Committee on Grain Breeding.  |
| F-10 | 1978      | Served as coordinator of a research project for the Flax Growers Western Canada to develop management practices for fiber flax production and to evaluate fiber flax varieties in western Canada (funded by New Crop Development, Ag. Canada). |
| F-11 | 1978      | Invited to revise sections pertaining to flax in the book "Principles and practices of commercial farming" published by the University of Manitoba.  |

- |      |           |   |
|------|-----------|---|
| F-12 | 1981-1982 | Served a project co-ordinator for the New Crops Development Fund project "Hybrid Canola Varieties for Western Canada" at the University of Manitoba, Winnipeg. Submitted progress reports.  |
| F-13 | 1982      | Invited by the Canadian Grain Commission to prepare a section on plant breeding in flax in the book "Grains and Oilseeds" published by the Canadian International Grains Institute.   |
| F-14 | 1983      | Appointed member of a Task Group, Cereals and Oilseeds (Export), Crop Production Technology by the Manitoba Agriculture Steering Committee. Purpose of the Task Group was to identify specific opportunities and/ constraints and to provide initiatives to increase production of cereal, oilseed and special crops in Manitoba. Responsibilities included preparing a report on six non-cereal crops. |
| F-15 | 1984-1985 | Appointed Chairperson of the Oilseed and Special Crops Subcommittee of the Crop Science Lead Committee of MASCC.  |
| F-16 | 1984-1986 | Appointed member of the Expert Committee on Grain Breeding.   |
| F-17 | 1985      | Awarded an Honourary Life Membership from the Canadian Seed Growers Association, Manitoba Branch, in "recognition of valuable service to the seed industry of Manitoba".  |
| F-18 | 1986      | Appointed to a committee organized by the Regional Development Branch to develop a commodity based development strategy paper for grains and oilseed crops in Manitoba which was submitted to ACDC.   |
| F-19 | 1987-1995 | Appointed to the Research and Technical Committee of the Flax Council of Canada representing the Research Branch.   |
| F-20 | 1987      | Reviewed a cooperative and development proposal for the University-Industry program of NSERC.   |
| F-21 | 1988      | Invited by the Flax Council of Canada to participate in a flax research priorities conference and present a paper in "research priorities in flax breeding in Canada".  |
| F-22 | 1990      | Awarded Honourary Life Member of the Canadian Seed Growers Association "in recognition of services to the association and contribution to Canadian agriculture".  |

- hr/>
- |      |      |  |
|------|------|--|
| F-23 | 1991 | Reviewed a research proposal "Agrobacterium mediated transfer of HOE 039866 (Ignite) tolerance to flax" for NSERC.   |
| F-24 | 1994 | Awarded the Governor-General Commemorative Metal for the 125th Anniversary of Canada's Confederation on behalf of the "Flax Team" of the Agri-Food Diversification Centre.     |
| F-25 | 1995 | Invited with Dr. D. Oomah to prepare a chapter on "Cultivars and agronomic aspects" in the book "Flaxseed in human nutrition" published by the American Oil Chemists' Society. |
| F-26 | 1995 | Invited by the Flax Council of Canada to participate in a conference to determine research priorities in crop management and plant breeding in flax.                           |